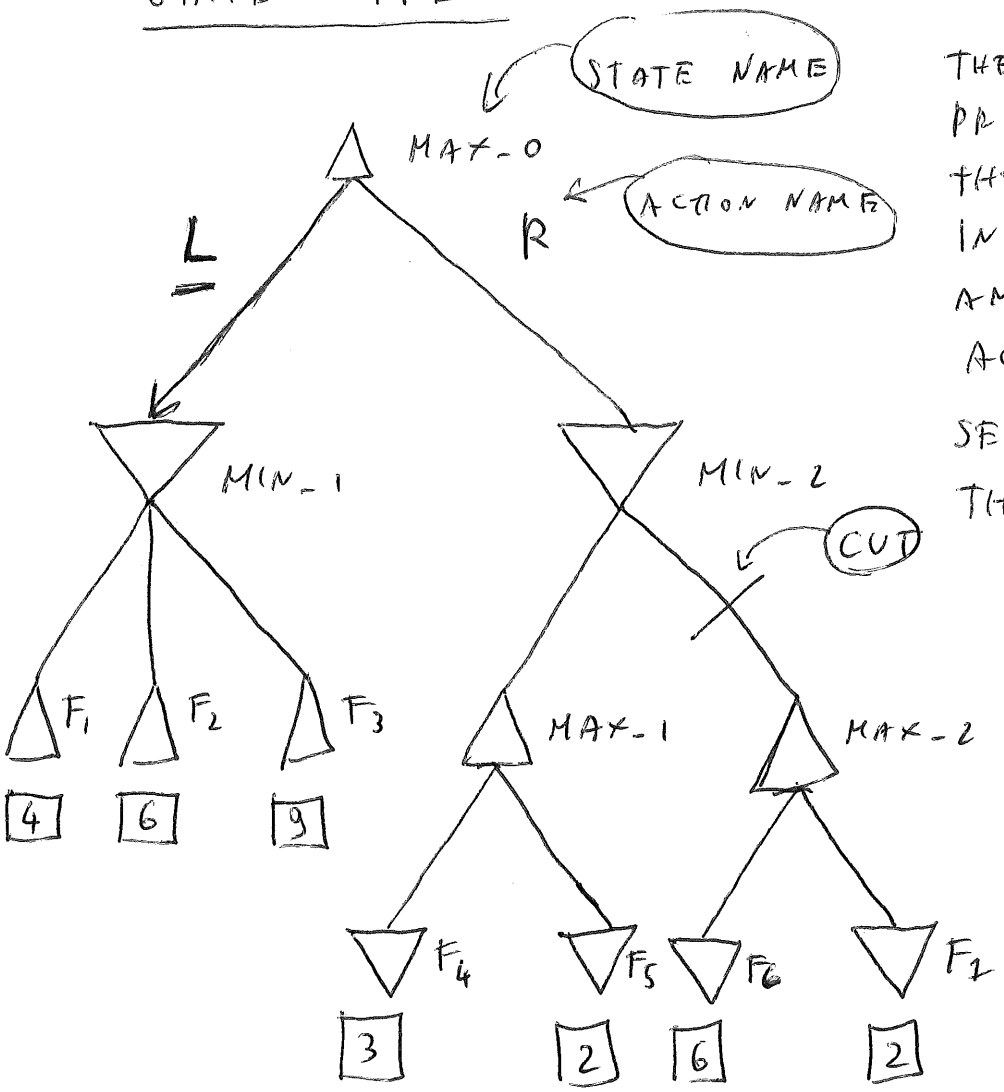
MINIMAX 26 SEP. 2013

GAME TREE



ANSWER

THE ALPHA-BETA-SEARCH PROCEDURE PERFORMS THE CUT HIGHLIGHTED IN THE GAME TREE AND RETURNS THE ACTION (L)

SEE NEXT PAGE FOR THE EXECUTION TRACE

SCHEME OF RECURSIVE PROCEDURES

```
ALPHA-BETA-SEARCH (S)
    V = MAX-VALUES (S, -∞, +∞)        (S: STATE; α, β)
    RETURN THE ACTION THAT ACHIEVES V
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```
MAX-VALUES (S, α, β)                  (VALUE OF STATE S)
    IF S ∈ FINAL_STATES RETURN V(S)
    V = -∞
    FOR s' ∈ SUCCESSORS (S)
        V = MAX (V, MIN-VALUES (s', α, β))
        IF V ≥ β RETURN V             ← (CUT)
        α = MAX (V, α)
    RETURN V
```

```
MIN-VALUES (S, α, β)
    IF S ∈ FINAL_STATES RETURN V(S)
    V = +∞
    FOR s' ∈ SUCCESSORS (S)
        V = MIN (V, MAX-VALUES (s', α, β))
        IF V ≤ α RETURN V
        β = MIN (V, β)
    RETURN V
```

EXECUTION TRACE

INIT STATE → MAX_0, α = -∞, β = +∞

TIME_STEP ①

MAX-VALUES (MAX_0, -∞, +∞)

T: ① ④ T: ① ④ ⑧

V: -∞ 4 α: -∞ 4

RETURN THE ACTION THAT ACHIEVES 4 (I.E., L)

L R

① MIN-VALUES (MIN_1, -∞, +∞)

T: ① ② T: ① ② ④

V: +∞ 4 β: +∞ 4 RETURN 4

② MAX_VALUES (F1, -∞, +∞)

RETURN 4

③ MAX-VALUES (F2, -∞, 4)

RETURN 6

④ MAX-VALUES (F3, -∞, 4)

RETURN 3

⑤ MIN-VALUES (MIN_2, 4, +∞)

T: ⑤ ⑧ T: ⑤ ⑧

V: +∞ 3 β: +∞ V ≤ α

3 ≤ 4

↓

RETURN 3

CUT

⑥ MAX_VALUES (MAX_1, 4, +∞)

T: ⑥ ⑦ T: ⑥ ⑧

V: -∞ 3 α: 4 RETURN 3

⑦ MIN_VALUES (F4, 4, +∞)

RETURN 3

⑧ MIN_VALUES (F5, 4, +∞)

RETURN 2

MAX_2

F6 F7